CHAPTER 1

INTRODUCTION

1.1 SMEs Cluster and Knowledge Management

In an economy where knowledge becomes a source of innovation, there are increasing necessities for firms to acquire new knowledge and technology and apply to business process or add value to their products. One of the primary sources of innovation in recent decade is originated by Small and Medium-sized Enterprises (SMEs). SMEs are defined as non-subsidiary, independent firms which employ a small given number of employees or asset values which vary across national systems. The major roles of SMES in economic growth are the high employment rate which in turn affects the increasing digit number of GDP. Organization for Economic Co-operation and Development (OECD) report has shown that some 30%-60% of SMEs in the OECD area are characterized as innovative (Murphy, 2002). For Thailand, government's interest in promoting SMEs has been initiated after the disastrous financial crash in 1997. Many large companies are bankrupt or in debt due to the huge deficit from high investment in equipments but small returns. Only SMEs that are the suppliers to the large companies are still survive due to their flexible structure. To rapidly recover the country deficit problems, SMEs are contributed by the government since then. Currently, SMEs promotion plan II (2007-2011) is proposed by the Office of Small and Medium Enterprises Promotion (OSMEP) as shown in

Figure 1.1. For the year of 2009 promotion policy, OSMEP is committed to support the existing SMEs and create a new one.

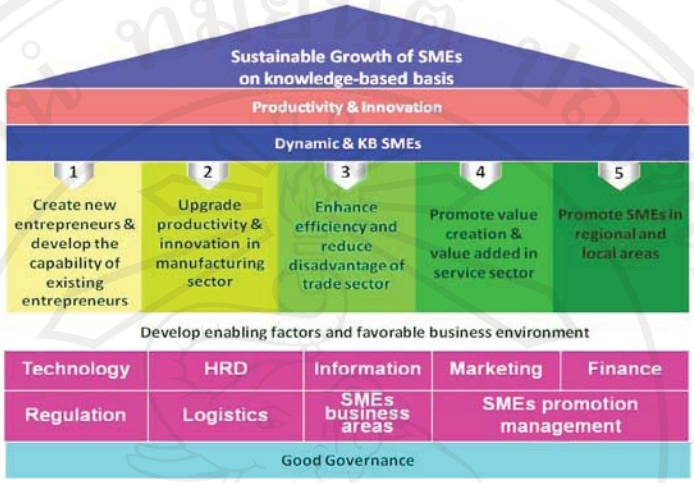

Figure 1.1 Thailand SMEs promotion plan 2007-2011 (OSMEP, 2007)

For some reasons, however, there are some limitations of SMEs to compete and innovate in the global market. Financial problem, for example, obstructs company expansion while fierce competition from global markets forces SMEs to innovate. Accordingly, SMEs tend to reform themselves by linking interconnected companies and institutions in particular field to "Cluster". "The simple definition of cluster can be classified into two types: vertical clusters, and horizontal clusters. Vertical clusters are made up of industries that are linked through buyer-seller relationships. Horizontal clusters include industries which might share a common market for the end products, use a common technology or labor force skills, or require similar natural resources (Porter, 1990)." Through networking of cluster, SMEs are able to capture market opportunities, achieve economies of scale in the purchase of inputs and improve their skills. This allows companies to operate more productively and

increase ability to innovate. In most industrialized countries, cluster is mainly encouraged by government policy in knowledge sharing, such as building networks, increasing joint R&D, and promoting strategic alliances (Tichy, 1998). In contrast to the developing countries, policy is focused on the establishment of technology infrastructure to promote innovative capability and to develop knowledge-based system.

Ceramic cluster is one of the most distinct geographical clusters in Thailand. It ranks 7th of the potential industrial clusters, is 1/3 of the rough total of 600 ceramic firms, and is 10% of the total ceramic exports in Thailand. However, it is not quite successful in terms of cluster development. For example, there are few entrants of new firms while some of existing firms have withdrawn from the cluster.

Table 1.1 Initial investigation of 30 CeraCluster members

Title	Frequency (Percent)
1. Open and frequent communication.	93.33
2. Partner keeps informing useful information to each other.	93.33
3. Communication is complete and reliable.	**65.00**
4. Communication is exact and on time.	**62.50**
5. Members have trust for members and organization	**69.17**
6. Partner keeps informing useful information to each other	80.00
7. In case of any problem about collaboration between you and your partner, you and your partner solve the problem together.	**16.67**
8. You share some confidential information among the cluster	**39.17**

From the initial investigation of ceramic cluster in Lampang, it is found that 5 groups of ceramic cluster are formed in 2005. Lately established in 2007 is "CeraCluster" which seems to be the only active cluster in Lampang but only few activities and collaborations still exist nowadays. Table 1.1 shows that communications, collaborations and information sharing among members are somewhat low. Lacks of communication and collaborations are among of key obstacles for cluster development. Current practice in managing collaborations and knowledge sharing in ceramic cluster mainly depends on human-based activity such as seminar and face-to-face meeting. Only small joint projects have been done between a few members. Discontinuity in collaboration activity and lower degree of interaction from both internal and external environments cause an obstruction in promoting knowledge sharing and cooperation. Hence, knowledge transfer is not fulfilled and cluster cannot be developed in a sustainable way.

Knowledge Management (KM) is one of management approaches that identify, manage, and share all of the organization's information assets such as databases, documents, policies and procedures (explicit knowledge), as well as the unexpressed expertise and experience (tacit knowledge) resided in individuals (Jones, 2003). KM helps an organization to create a new working environment where knowledge and experience can easily be shared and also enables information and knowledge to emerge and flow to the right people at the right time so they can efficiently use it supporting their tasks (Smith, 2001). A knowledge management system (KMS) facilitates KM functions by ensuring knowledge flow from the known person(s) to the

need-to-know person(s) throughout the organization. In this way, knowledge evolves and grows (new knowledge created) during the process.

1.2 Research Problems

Communication, knowledge workers' collaboration, knowledge sharing and dissemination between firms are seen by many scholars and policy makers as important elements in the functioning of a competitively successful and technologically dynamic industrial cluster (Malmberg and Power, 2005; Sölvell et al., 2003). However, from the initial investigation of the CeraCluster in Lampang (see Figure 1.2), the collaboration, knowledge sharing and dissemination are rather low. One of the important causes of problems is the communication failures. The most frequent activities of collaboration, knowledge sharing and dissemination are monthly meeting or person-to-person phone call. Therefore, information/ knowledge from conversation does not stored in a systematic way. Even worse when the cluster members have lost contacts from others and cannot review or catch up information up-to-date. Knowledge Management is one of the practical approaches that help spread individual or group knowledge across organizations (Levy et al., 2003) and Knowledge Management System is the strategic management tool to make the KM approach successful.

From the theoretical concept, industrial cluster comprises various sectors of enterprises: core firms, Cluster Development Agent (CDA), local and government agencies, supporting industries. Naturally, "*different types of users*" have "*different*

requirements and different objectives". For examples, managers and expert of the medium core firms need information and knowledge about new technologies and R&D while some small firms need to improve the skills of their workers. Furthermore, different requirements usually vary based on the changes of time and events across the business process cycle. Some medium-to-large firms may attend the international fair dining at Ambiente, Germany while other small firms interest only local ceramic events. Therefore, to support communication, collaboration and knowledge sharing in cluster, the KMS must be designed to meet the different views of different types of users in three aspects: response, time and events. To address such problems, the research must focus on the following issues:

• The design of the KMS must be dynamic to cope with different types of users and different requirements.

• The process of KMS development must be evolved to correspond with the cycle of business process in cluster

1.3 Overview of Research

According to Porter et al. (2003), shared infrastructure and strong linkages in cluster create so-called agglomeration effects in terms of higher specialization, innovation and knowledge transfer which results in costs reduction and improving competitiveness. The degree of cooperating events, activities, and interactions among cluster members are therefore key factors for the development of business

partnerships and the dynamism of cluster. Many successful clusters in the developed countries formulate naturally. However, clusters in most developing countries are mostly initiated by the governmental promotion project. One of the ceramic cluster leaders expressed that "clustering members do not understand the cluster context so they enter cluster to take advantages but not to give. They do not come to the cluster based on the mutual trust". Sureephong et al. (2007) also proposed the sharing model of cluster based on the consumption that "cluster will be developed only if the members share what they are willing to share". Therefore, communication, collaboration and knowledge sharing among members are more temporary and poor.

KMS is generally considered to be a strategic tool to promote communication, collaboration and knowledge sharing. To develop the proper KMS, however, it must be guaranteed that members will use and share it in a sustainable way. Many software projects fail to meet user requirements. Social networking software is becoming the new trend of collaborative web based solution. WEB 2.0 technologies and tools offer many unique and powerful information sharing and collaboration features without requiring high technological skills to use these feature. The web based communities and hosted services, such as wikis discussion forums, social-networking sites and blogs are examples supporting these concepts.

In the globalized strong competitive situation, the ability to keep up with the rapid changes of new technologies is required. Therefore, the development of KMS must be able to catch up such high speed changes of new advanced technologies. The

speed of creating new knowledge in response with the changing organizational environments and infrastructure must also be recognized and increased.

In the research, the synchronization of KM and software engineering (SE) in a spiral loop called “Double spiral” is proposed to confirm that the KMS based on the above ideas meets its goal. Each loop of double spiral represents the analysis and design stage of software development and gives the result of system prototype which is implemented on-line. Each loop also corresponds to cluster business cycle in every year. By communicating and sharing of knowledge from using the prototype helps users see the system risks such as incomplete requirements, system errors, etc. Learning at the end of each cycle, the next version of prototype in the following cycle tends to be more complete and successful.

1.4 Research Objective

The objective of this research is to build a knowledge-based system to aid the users and developers in the process of the KMS development in the following ways:

• To build the KMS that provides a dynamic and personalized web services for individual cluster members.

• To design the workshop that encourages users, developers and decision makers to work together informally and collaboratively on determining the requirements to map out the prototype

• To propose the model that synchronize KM and SE to support learning process in the spiral way

The focus is not only on analysis and design stage to capture the requirements from all stakeholder requirements in an iterative process but also to develop the incremental prototype to reduce system risks before moving forward to the next development cycle.

1.5 A Brief Overview of Research Approach

To motivate and increase collaboration and sharing of knowledge among members, the KMS must be designed to provide dynamic environments in virtual communities of practices (vCoPs) and respond to each participant's business requirements. Three dynamic components of KMS including response, time, and events are considered. Firstly, the system must respond to all individual requirements. Secondly, the updated information must be pushed to the members automatically as time changes. Finally, planned or unplanned, private or public information must be easily managed and customized by groups or individuals. To achieve such ideas, social networking web 2.0 with the design technique of cascade style sheet (CSS) is adapted. The concept of push technology is to send information directly to client users without requesting or reloading the information. The CSS helps design the webpage based on individual needs.

Moreover, the repeatable software process is used for the design and development of KMS. This approach is suitable for the system where the requirements varies or difficult to specify. Incremental prototype using evolutionary model will help in identifying requirements more clearly. Therefore, the proposed design of KMS will have capabilities to support the dynamic information to different types of users. A proper team and the involvements of key users and developer are significant to the completion of the system. Requirements can be captured along with the progression of system prototype through joint application development (JAD) session. At the end of each cycle, system evaluation based on user satisfactions is discussed. Any concerned system risks must be solved or diminished. Using double spiral technique, learning from past experiences will move forward to the next cycle of software process. New version of prototype which will be used in the next business process cycle tends to be more productive.

The novelty of this research is the proposal of the double spiral model which combine the software process with knowledge conversion process in a spiral way. This correspond to the evolved business process cycle which requirements always change or unclear. JAD technique is supporting tool for the double spiral process.

1.6 Organization of Thesis

The thesis is divided into 5 chapters:

Chapter 1 is this introduction chapter.

Chapter 2 contains a critical literature review, covering the SMEs and industrial cluster, knowledge management, social network theory, web 2.0 concepts and technologies, and software development process.

Chapter 3 is the research methodology which contains 5 main stages including identification of key players, design of workshop and requirement analysis, KMS design and development, learning in action and KMS evaluation.

Chapter 4 reports on the experimental result, analysis and discussion.

Chapter 5 is the conclusion of the thesis.